Attorney Docket No. 128346.31801

REMARKS

Applicant has thoroughly reviewed the outstanding Office Action including the Examiner's remarks and the references cited therein. The present amendments and the following remarks are believed to be fully responsive to the Office Action and are believed to render the claims at issue patentable. The amendments do not present new matter and are supported by the Specification.

Specifically, Applicants have added a limitation to Claim 1, wherein the CBN product has as oxygen content of less than about 300 ppm. Support for this amendment may be found in original claim 7 and in Examples 1-5. The Examples show the direct relationship between oxygen content of the CBN product and toughness and thermal toughness of the CBN product. The Examples also show that using an oxygen getter in the HP/HT process results in a CBN product with low oxygen content and high toughness and thermal toughness.

Applicants have amended claim 15 so that it may be presented in independent form. New claims 19-22 depend from amended claim 15. New claims 23-28 describe a method for improving toughness of a CBN product employing an oxygen getter comprising titanium. Support for these new claims may be found on page 3, lines 25-35 and in original claim 2.

As such, claims 1-3, 8-9, 11, 15 and 19-28 remain pending in the present application. Applicants respectfully reserve the right to present claims directed to any appropriate subject matter in any divisional, continuation, and continuation-in-part application including claims directed to any subject matter found in cancelled claims 4-7, 10, 12-14, and 16-18.

Rejections under 35 U.S.C. § 112

Claims 2 and 5-6 are rejected under 35 U.S.C. § 112, second paragraph. Applicants have amended claim 2 to be in proper format and to include the limitations of claims 5 and 6. Applicants have cancelled claims 5 and 6. As such, Applicants request reconsideration of this rejection.

Claim Rejections Under 35 U.S.C. § 102(b) / §103(a)

The Examiner has rejected claims 1-18 under 35 U.S.C. § 102(b) as anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as obvious over French Patent No. 2686101 (the "French Patent"). The Examiner states that the French Patent discloses a method for preparing cubic boron nitride by converting hexagonal boron nitride at high pressures and temperatures in the

presence of at least one additive element. The Applicants respectfully request reconsideration of the Examiner's rejection. It is maintained that not every element of the claimed process is taught by the French Patent nor is the presently claimed invention rendered obvious by the French Patent.

To anticipate a claim, a reference must disclose each and every element of the claim. Lewmar Marine v. Varient Inc., 3 U.S.P.Q.2d 1766 (Fed. Cir. 1987). Establishing a prima facie case of obviousness requires that all elements of the invention be disclosed in the prior art. In re Wilson, 165 U.S.P.Q. 494, 496 (C.C.P.A 1970). To support a prima facie case of obviousness, the reference must be viewed without the benefit of impermissible hindsight vision afforded by the claimed invention. Hodosh v. Block Drug Co., Inc., 786 F.2d 1136, 1143 n.5, 229 USPQ 182, 187 n.5 (Fed. Cir. 1986). In order to support a prima facie case of obviousness, the motivation to modify a reference to arrive at the presently claimed invention must be taught in the reference, and not in the present application. The mere fact that a reference may be modified does not render the resultant invention obvious unless the prior art also suggests the desirability of the modification. In re Mills, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 2000).

In independent claims 1 and 15, a CBN product-forming feedstock is processed with a oxygen getter in a HP/HT process to obtain a CBN product with improved toughness properties and with an oxygen content of less than 300 ppm. The French Patent teaches a method for preparing cubic boron nitride by converting hexagonal boron nitride at high pressures and temperatures. The French Patent is silent however as to which method conditions are necessary to result in a CBN product that has improved toughness properties and an oxygen content of less than 300 ppm. It is not obvious from the reading of the French Patent that a HP/HT process in the presence of an oxygen getter effectively increases the toughness of a CBN product while decreasing the oxygen content of the CBN product. The relationship between oxygen content of the CBN product and toughness properties is described in the current Application alone. Therefore, it is not obvious from a reading of the French Patent that a CBN product as claimed may have improved toughness properties and an oxygen content of less than 300 ppm.

As to new claims 23-28, the Applicants claim a method for improving toughness of a CBN product by the presence of an oxygen getter comprising titanium, wherein the amount of oxygen getter in said blend is sufficient to improve the toughness of the CBN product. A reading of the French patent does not render these claims obvious. The French patent does not analyze the

physical properties of the CBN product. The French patent does not describe the relationship between the oxygen getter and the resulting physical properties of the CBN product. Only upon a reading of the present disclosure, is this relationship appreciated, described and claimed. The French patent does not recognize the need to synthesize CBN in a manner in which the resulting toughness parameters are controlled. The motivation to arrive at the presently claimed methods in claims 23-28 is found in the present application alone.

Claim Rejections Under 35 U.S.C. § 102(b) / §103(a)

The Examiner has rejected claims 1, 3-18 under 35 U.S.C. § 102(b) as anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as obvious over British Patent No. 2058840 (the "British Patent"). The Examiner states that the British Patent discloses a method for preparing polycrystalline boron nitride by treating boron nitride at high temperatures and pressures in the presence of a transition metal nitride such as titanium nitride. The Applicants respectfully request reconsideration of the Examiner's rejection.

The British Patent discloses a method for producing *polycrystalline* boron nitride (PCBN) by incorporating a transition metal nitride in the system. These compacts are generally used to machine ferrous-based alloys. The British Patent therefore describes the use of a transition metal nitride added to the PCBN system to improve a compact's resistance to chemical attack.

In independent claims 1 and 15, a CBN product-forming feedstock is processed with a oxygen getter in a HP/HT process to obtain a CBN product with improved toughness properties and with an oxygen content of less than 300 ppm. The British Patent is silent however as to which method conditions are necessary to result in a CBN product that has improved toughness properties and an oxygen content of less than 300 ppm. It is not obvious from the reading of the British Patent which teaches how to improve a PCBN compact's resistance to chemical attack, that a HP/HT process in the presence of an oxygen getter effectively increases the toughness of a CBN product while decreasing the oxygen content of the CBN product. The relationship between oxygen content of the CBN product and toughness properties is described in the current Application alone.

As to new claims 23-28, the Applicants claim a method for improving toughness of a CBN product by the presence of an oxygen getter comprising titanium, wherein the amount of oxygen getter in said blend is sufficient to improve the toughness of the CBN product. The British

Patent does not analyze the physical properties of a CBN product or describe the relationship between the oxygen getter comprising titanium and the resulting physical properties of the CBN product. Only upon a reading of the present disclosure, is this relationship appreciated, described and claimed. The British Patent does not recognize the need to synthesize CBN in a manner in which the resulting toughness parameters are controlled. The motivation to arrive at the presently claimed methods in claims 23-28 is found in the present Application alone.

Claim Rejections Under 35 U.S.C. § 102(b) / §103(a)

The Examiner has rejected claims 1-18 under 35 U.S.C. § 102(b) as anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as obvious over Japanese Patent No. 358060604 (the "Japanese patent"). The Examiner states that Japanese patent discloses a method of converting a hexagonal boron nitride to cubic boron nitride at high temperatures and pressures in the presence of a catalyst such as silicon, aluminum, aluminum nitride, and calcium nitride. The Applicants respectfully request reconsideration of the Examiner's rejection.

The Japanese patent refers to the silicon, aluminum, aluminum nitride, and calcium nitride materials as "catalysts" or "solvent" and not as "oxygen getters". At the appropriate HP/HT conditions, the solubility of hexagonal boron nitride (hBN) is greater than that of cubic boron nitride (CBN) in the catalyst. Under these conditions, the hBN dissolves into the catalyst while the CBN precipitates out of the catalyst. Catalysts for the commercial production of CBN include the nitrides of many transition metals. The Applicants maintain that the motivation to use an "oxygen getter", not as a catalyst or solvent, but as a means to remove oxygen present in the reaction system is found in the present Application and not in the Japanese patent.

The Japanese patent does not describe any relationship between the use of the transition metals as oxygen getters and a CBN crystal having low oxygen concentration as presently claimed in claims 1 and 15. No relationship between CBN product toughness and oxygen concentration is taught or suggested.

The Applicants note that this reference does mention oxygen concentration in relation to the starting material, hexagonal boron nitride (hBN), but not in relation to the CBN product. The Japanese reference teaches that processing hBN with lower concentrations of oxygen generally gives CBN in high yield. Thus, the starting material is selected in relationship to yield. The Applicants maintain that the selection of starting materials is not the same as selecting processing

conditions so that the final product has certain chemical and physical properties. Therefore, the Applicants maintain that even if oxygen content in the starting material may be linked to reaction yield, this linkage does not render the presently claimed invention obvious.

As to new claims 23-28, the Applicants claim a method for improving toughness of a CBN product by the presence of an oxygen getter comprising titanium, wherein the amount of oxygen getter in said blend is sufficient to improve the toughness of the CBN product. Applicants maintain that the transition metal titanium is nowhere mentioned or suggested by the Japanese patent. The Japanese patent does not describe the relationship between titanium and the resulting physical properties of the CBN product. Only upon a reading of the present disclosure, is this relationship appreciated, described and claimed. The Japanese patent does not recognize the need to synthesize CBN in a manner in which the resulting toughness parameters are controlled. The motivation to arrive at the presently claimed methods in claims 23-28 is found in the present application alone.

Since there is no discussion or suggestion of the claim limitations as found in independent claims 1, 15 and 23 in the Japanese patent, Applicants request reconsideration.

Claim Rejections Under 35 U.S.C. § 102(b) / §103(a)

The Examiner has rejected claims 1, 3-18 under 35 U.S.C. § 102(b) as anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as obvious over the Article by Sato et al. The Examiner states that the Article by Sato et al. discloses a synthesis of cubic boron nitride from hexagonal boron nitride under high temperatures and pressure using magnesium nitride as a catalyst. The Applicants respectfully request reconsideration of the Examiner's rejection.

The Sato Article refers to magnesium nitride in relationship to the oxygen content of the starting material. Specifically, the reference teaches that MgO precipitates as a byproduct in this system. The reference states that this precipitation "interferes with the free growth of CBN crystals" and that the precipitation increases with the oxygen content of the starting material. This reference suggests that the use of a low content starting material (hBN) should be used to minimize interference with the growth of CBN crystals. Additionally, the reference suggests that the use of Zr powder may increase CBN yield.

As described above, a reference that uses Zr powder to increase yield does not render the presently claimed invention of Claims 1 and 15 obvious. No where are the presently claimed

"oxygen getters" described or suggested. The Sato Article does not describe any relationship between the use of the transition metals as oxygen getters and a CBN product having high toughness and having an oxygen content of less than about 300 ppm as specifically claimed in claims 1 and 15. No relationship between CBN product toughness and oxygen concentration is taught or suggested.

As to new claims 23-28, the Applicants claim a method for improving toughness of a CBN product by the presence of an oxygen getter comprising titanium, wherein the amount of oxygen getter in said blend is sufficient to improve the toughness of said CBN product. Applicants maintain that the transition metal titanium is nowhere mentioned or suggested by the Sato Article. The Sato Article does not describe the relationship between the oxygen getter and the resulting physical properties of the CBN product. Only upon a reading of the present disclosure, is this relationship appreciated, described and claimed. Since there is no discussion or suggestion of the claim limitations as found in independent claims 1, 15 and 23 in the Sato Article, Applicants request reconsideration.

Claim Rejections Under 35 U.S.C. § 102(b) / §103(a)

The Examiner has rejected claims 1, 3-18 under 35 U.S.C. § 102(b) as anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as obvious over Farafontov el al., U.S. Patent No. 4,148,863 (the '863 patent). The Examiner states that the '863 Patent discloses a high temperature high pressure treatment of hexagonal boron nitride to prepare polycrystalline cubic boron nitride in the presence of zinc. The Applicants respectfully request reconsideration of the Examiner's rejection.

This reference discloses a method for producing polycrystalline boron nitride (PCBN) by incorporating zinc in the system. The '863 patent describes the use of zinc added to the PCBN system to improve a compact's wear resistance. The '863 patent therefore is silent as toward CBN products, oxygen content being related to toughness and thermal toughness in CBN products, and processing conditions useful for achieving desirable properties in CBN products. Therefore, it is maintained that not every element of the claimed independent claims is taught by the '863 patent nor is the presently claimed invention rendered obvious by the '863 patent.

The '863 patent does not describe any relationship between the use of the transition metals as oxygen getters and a CBN crystal having low oxygen concentration as presently claimed in

claims 1 and 15. No relationship between CBN product toughness and oxygen concentration is taught or suggested.

As to new claims 23-28, the Applicants claim a method for improving toughness of a CBN product by the presence of an oxygen getter comprising titanium, wherein the amount of oxygen getter in said blend is sufficient to improve the toughness of the CBN product. Applicants maintain that the transition metal titanium is nowhere mentioned or suggested by the '863 patent. The '863 patent does not describe the relationship between the oxygen getter and the resulting physical properties of the CBN product. Only upon a reading of the present disclosure, is this relationship appreciated, described and claimed.

Claim Rejections Under 35 U.S.C. § 102(b) / §103(a)

The Examiner has rejected claims 1-4, 7-18 under 35 U.S.C. § 102(b) as anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as obvious over Taylor el al., U.S. Patent No. 3,768,972 (the '972 patent). The Examiner states that the '863 Patent discloses a method for converting a boron nitride from the hexagonal to the cubic form at high temperatures and pressures in the presence of elemental aluminum. The Applicants respectfully request reconsideration of the Examiner's rejection.

The '972 patent refers to the aluminum and aluminum materials as "catalysts" and not "oxygen getters". Under HP/HT conditions, the catalyst in the production of CBN typically acts as a solvent for boron nitride, as described above. Catalysts for the commercial production of CBN include aluminum and aluminum materials. The Applicants maintain that the motivation to use an "oxygen getter", not as a catalyst or solvent, but as a means to remove oxygen present in the reaction system is found in the present Application and not in the '972 patent. The '972 patent does not any relationship between the use of the transition metals as oxygen getters and a CBN crystal having low oxygen concentration as presently claimed in claims 1 and 15. No relationship between CBN product toughness and oxygen concentration is taught or suggested.

As to new claims 23-28, the Applicants claim a method for improving toughness of a CBN product by the presence of an oxygen getter comprising titanium, wherein the amount of oxygen getter in said blend is sufficient to improve the toughness of said CBN product. Applicants maintain that the transition metal titanium is nowhere mentioned or suggested by the '972 patent.

The '972 patent does not describe the relationship between the oxygen getter and the resulting physical properties of the CBN product. Only upon a reading of the present disclosure, is this relationship appreciated, described and claimed.

Since there is no discussion or suggestion of the claim limitations as found in independent claims 1, 15 and 23 in the '972 patent, Applicants request reconsideration.

Claim Rejections Under 35 U.S.C. § 102(b) / §103(a)

The Examiner has rejected claims 1-4 and ,7-18 under 35 U.S.C. § 102(e) as anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as obvious over Shioi el al., U.S. Patent No. 6,508,996 (the '996 patent). The Examiner states that the '996 Patent discloses a method for converting hexagonal boron nitride to cubic boron nitride under high temperature and pressure in the presence of a silicon source. The Applicants respectfully request reconsideration of the Examiner's rejection.

The '996 patent teaches that the silicon source results in a CBN having improved toughness and that a boron source results in a CBN having improved cutting ability. This reference also states in column 2, lines 11-15 that "[s]ince oxygen impurities contaminated in the form of boron oxide or the like may retard conversion of the hexagonal boron nitride to cubic boron nitride, the starting materials with a less oxygen content are desired."

The '996 patent does not describe any relationship between the use of an oxygen getter and a CBN product having low oxygen concentration as presently claimed in claims 1 and 15. No relationship between CBN product toughness and oxygen concentration is taught or suggested.

The Applicants note that this reference does mention oxygen concentration in relation to the starting material, hexagonal boron nitride (hBN), but not in relation to the CBN product. The '996 patent teaches that processing hBN with oxygen impurities may retard conversion to CBN. The Applicants maintain that the selection of starting materials to achieve conversion is not the same as selecting processing conditions so that the final product has certain chemical and physical properties. Therefore, the Applicants maintain that even if oxygen content in the starting material may be linked to conversion, this linkage does not render the presently claimed invention obvious.

As to new claims 23-28, the Applicants claim a method for improving toughness of a CBN product by the presence of an oxygen getter comprising titanium, wherein the amount of oxygen

getter in said blend is sufficient to improve the toughness of said CBN product. Applicants maintain that the transition metal titanium is nowhere mentioned or suggested by the '996 patent. The '996 patent teaches that very specific chemicals in the HP/HT process results in very specific physical properties of the resulting CBN crystals. A reference that teaches the use of silicon for one very specific property and boron for another, certainly does not suggest that titanium may be used to process CBN product crystals with improved toughness. Only upon a reading of the present disclosure, is this relationship appreciated, described and claimed.

Since there is no discussion or suggestion of the claim limitations as found in independent claims 1, 15 and 23 in the '996 patent, Applicants request reconsideration.

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CONCLUSION

In light of the above amendments and remarks, Applicant respectfully submits that all pending claims 1-3, 8-9, 11, 15 and 19-28 as currently presented are in condition for allowance and hereby respectfully requests reconsideration. Applicant respectfully requests the Examiner to pass the case to issue at the earliest convenience.

Please note that this application has been assigned to Diamond Innovations, Inc. Our new docket number for this application is **128346.31801**. The Commissioner is hereby authorized to charge any additional fees which may be required for this submission, or credit any overpayment, to deposit account no. 50-0436.

Respectfully submitted,
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Date: May 14, 2004

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